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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/821,787	03/29/2001	Juergen Weichart	622/49809	8526

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EXAMINER
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MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 01/04/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.  
09/821,787

Applicant(s)

Weichart

Examiner  
Rodney McDonald

Art Unit  
1753



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_\_
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some\* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892) 18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 19) ☐ Notice of Informal Patent Application (PTO-152)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 6 20) ☐ Other:

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## **DETAILED ACTION**

### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Claim Rejections - 35 USC § 112***

2. Claims 1-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is indefinite because the phrase “a self-contained body” is unclear. Does the screen contain itself?

Claim 8 is indefinite because the word “envisioned” is unclear. Is the measuring apparatus present?

Claim 8 is indefinite because it is unclear if the limitations after both occurrences of the word “preferably” are present in the claim.

Claim 12 is indefinite because “the outside area” lacks antecedent basis.

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***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Donohoe (U.S. Pat. 5,449,433).

Donohoe teach in Fig. 3 a reactor of the present invention having the electrostatic shield in place. Fig.3 is the same as Fig. 2 with the exception of the electrostatic shield 17. The reactor has two loop antennas 11. The bell jar 10A is typically comprised of alumina or quartz or a similar dielectric which is removed relatively easily by the ion bombardment. The electrostatic shield 17 significantly decreases the capacitive coupling between the antenna 11 in the Mori source reactor (or the coils in another type of inductively coupled source) and the plasma. The capacitive coupling is decreased because the shield 17 protects or blocks the plasma from the antenna's electric field. The electric field is responsible for the capacitive coupling. (Column 3 lines 8-17; Column 4 lines 11-18; Figs. 2 and 3)

The shield in the preferred embodiment is cylindrical in shape and fits over the bell jar 10A portion of the reactor 10. However, it is possible to use a shield 17 having a hemispherical shape (not shown), or alternatively, having a combination cylindrical/hemispherical shape (not shown). The shield 17 is disposed between the bell jar 10A and the antennae 11, where it functions to

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substantially prevent capacitive coupling between the antennae 11 and the plasma. (Column 4 lines 40-48)

Bands or strips of metal 17C are located between the slits 17A. The bands 17C have a width which is preferably larger than the width of the intervening slits 17A. The width of the bands or strips 17C will vary, depending upon the reactor parameters chosen. However, generally the width in the relative range of 1 cm is used for the metal bands 17C. The width of the intervening slits 17A tends to be a little smaller, and is generally in the range of 0.2 cm to 0.5 cm. (Column 4 lines 49-57)

The electrostatic shield 17 is comprised of a conductive material, preferably copper. Copper is preferred due to its cost and availability, and the ease with which it can be cut. (Column 4 lines 58-61)

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor

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and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-4 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Donohoe (U.S. Pat. 5,449,433) in view of Ishimaru (U.S. Pat. 5,681,418).

Donohoe is discussed above and teach a slotted shield with a slot density of  $S \geq 0.5$  and slots having a width of 2 mm. (See Donohoe discussed above)

The differences between Donohoe and the present claims is that grounding the electrostatic shield is not discussed.

Ishimaru teach grounding the shielding plate 50. (Column 5 lines 29-34)

The motivation for grounding the shield is that it allows for suppressing sputtering and/or etching of the inner surface of the side wall of a vacuum bell jar. (Column 2 lines 18-21)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Donohoe by grounded a shield as taught by Ishimaru because it allows for suppressing sputtering and/or etching of the inner surface of the side wall of a vacuum bell jar.

7. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Donohoe in view of Ishimaru as applied to claims 1-4 and 10 above, and further in view of Hull (U.S. Pat. 4,431,901).

The differences not yet discussed is the offset relationship of the shield.

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Referring to FIGS. 3 and 4, the second embodiment of the invention is generally similar to the first embodiment shown in FIGS. 1 and 2. Elements of the second embodiment which are the same as elements of the first embodiment are like-numbered. The essential difference between the embodiment of FIGS. 3 and 4 and the embodiment of FIGS. 1 and 2 lies in the cross-sectional shape of the shield segments. Referring to FIG. 4, the plasma shield 38 of the second embodiment consists essentially of twelve shield segments 40 which are chevron-shaped in cross-section. Each segment 40 includes a central bore 40a and a water supply tube 42 located therein. Each segment 40 of the shield is thus cooled by means of the counterflow cooling system described above. The chevron cross-sectional shape of the segments 40 results in a partially interlocking arrangement between adjacent segments, wherein the gaps between the segments 40 are angled. This results in shielding of the quartz enclosure 12 and the coil 10 from direct radiation from the plasma in the cavity 22. At the same time, however, the angled gaps are found to permit adequate electrical coupling between the induction coil and the plasma gas in the cavity 22. Thus, improved heat and radiation shielding is obtained without diminishing the electrical performance of the plasma tube. (Column 7 lines 22-46)

The motivation for utilizing spaced apart gaps is that it allows for improved heat and radiation shielding. (Column 7 lines 44-46)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized spaced apart shielding as taught by Hull because it allows for improving heat and radiation shielding.

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8. Claims 7-9, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Donohoe in view of Ishimaru and further in view of Hull as applied to claims 1-6 and 10 above, and further in view of Nihei et al. (U.S. Pat. 4,999,096).

The differences not yet discussed is the power sources connected to the two electrodes and the controlling circuitry.

Referring to FIGS. 1 to 3, an embodiment of a thin film forming apparatus according to the present invention will be described. FIG. 3 diagrammatically shows waveforms used in the apparatus. In FIG. 3, PW denotes a sputter peak power (voltage), BW a sputter base power (voltage), PV a bias peak voltage, BV a bias base voltage, BW/PW a sputter base power ratio,  $T2/(T1+T2)$  a bias ratio, and  $(T1+T2)$  a switching period. Referring to FIG. 1, the thin film forming apparatus comprises a waveform-controlled sputter power source 2, a constant-voltage waveform-controlled reverse sputter power source 1, a bias current detecting sensor 4, a high frequency coil 5 for generating plasma, a bias current controlling high frequency power source 3 for controlling a bias current and enabling a stable discharge at a high vacuum region, a vacuum chamber 17 within which film is formed, a substrate (e.g., Si substrate) 8, a target 6, insulators 10, and an optional waveform generator 9 made of a CPU and the like for setting sputter power, bias voltage and current waveforms under program control. (Column 4 lines 55-68; Column 5 lines 1-9)

With the thin film forming apparatus constructed as above, first the optional waveform generator 9 sets the sputter power waveform, bias (reverse sputter) waveform and bias current.



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These signals set by the optional waveform generator 9 are supplied to the waveform controlled sputter power source 2, constant-voltage waveform controlled reverse sputter power source 1 and bias current controlling high frequency power source 3. These power sources have feedback functions to maintain the waveforms as set, even under variation of loads or the like. Therefore, a change in any one set value will not affect the other values. A bias current control method which is one of the features of this invention will be described in detail. A bias current with the bias ~~voltage~~ set, e.g., at 150 V changes if for example a sputter power is changed. To avoid this, a bias current is detected by the bias current detecting sensor 4 and compared with a signal set by the optional waveform generator 9. Based on this comparison, the bias current is maintained at the set value by controlling a high frequency power supplied to the high frequency coil 5 by means of the bias current controlling high frequency power source 3. These operations serve to maintain stable discharge at a high vacuum region. (Column 5 lines 10-33)

The motivation for utilizing power sources connected to two electrodes is that it allows for improving step coverage and for providing quality aluminum wiring for an integrated circuit device. (Column 1 lines 59-62) The motivation for utilizing control circuitry is that it allows for maintaining stable discharge. (Column 5 lines 32-33)

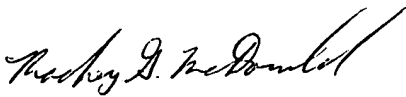
Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized power source connected to two electrodes and for providing controlling circuitry as taught by Nihei et al. because it allows for improving step coverage, for providing quality aluminum wiring for an integrated circuit and for maintaining stable discharge.

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9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney McDonald whose telephone number is (703) 308-3807. The examiner can normally be reached on Monday through Thursday from 8:00 to 5:00. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on (703) 308-3322. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3599.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



**RODNEY G. MCDONALD**  
PRIMARY EXAMINER

RM

January 2, 2002